

CLAIMS

1. A vehicle comprising:
 - a frame, a drive train and a chassis, including at least one lockable entry portal and portal unlocking functionality; and
 - an access control assembly for governing authorized access to said at least one lockable entry portal comprising:
 - at least one at least partially light transmissive user finger engagement surface accessible from outside said chassis;
 - an illuminator operative to illuminate at least one user finger engagement plane adjacent said at least one user finger engagement surface;
 - a two-dimensional imaging sensor viewing said at least one user finger engagement surface, from a location inwardly of said at least one finger engagement surface, for sensing light from said illuminator scattered by engagement of a user's finger with said at least one finger engagement surface; and
 - a data entry processor receiving an output from said two-dimensional imaging sensor and providing a data entry input to said portal unlocking functionality.
2. A vehicle according to claim 1 wherein said illuminator is located at a location inwardly of said at least one engagement surface.
3. A vehicle according to claim 1 wherein said at least one finger engagement surface comprises a one-dimensional array of a plurality of finger engagement surfaces.
4. A vehicle according to claim 1 wherein said at least one finger engagement surface comprises a two-dimensional array of a plurality of finger engagement surfaces.
5. A vehicle according to claim 1 and also comprising an illumination director

cooperating with said illuminator for providing an illumination beam generally parallel to said at least one finger engagement surface.

6. A vehicle according to claim 5 wherein said illumination director comprises a prism.

7. Access control apparatus for use with a vehicle including a chassis having at least one lockable entry portal and portal unlocking functionality and also including at least one at least partially light transmissive user finger engagement surface accessible from outside said chassis, said access control apparatus comprising:

an illuminator operative to illuminate said at least one user finger engagement surface;

a two-dimensional imaging sensor viewing said at least one user finger engagement surface from a location inwardly of said at least one finger engagement surface for sensing light from said illuminator scattered by engagement of a user's finger with said at least one finger engagement surface; and

a data entry processor receiving an output from said two-dimensional imaging sensor and providing a data entry input to said portal unlocking functionality.

8. Access control apparatus according to claim 7 wherein said illuminator is located at a location inwardly of said at least one engagement surface.

9. Access control apparatus according to claim 7 wherein said at least one finger engagement surface comprises a one-dimensional array of a plurality of finger engagement surfaces.

10. Access control apparatus according to claim 7 wherein said at least one finger engagement surface comprises a two-dimensional array of a plurality of finger engagement surfaces.

11. Access control apparatus according to 7 and also comprising an illumination director cooperating with said illuminator for providing an illumination beam generally parallel to said at least one finger engagement surface.

12. Access control apparatus according to claim 11 wherein said illumination director comprises a prism.

13. Access control apparatus for use with an enclosure having at least one lockable entry portal and portal unlocking functionality and also including at least one at least partially light transmissive user finger engagement surface accessible from outside said enclosure, said access control apparatus comprising:

an illuminator operative to illuminate said at least one user finger engagement surface;
a two-dimensional imaging sensor viewing said at least one user finger engagement surface from a location inwardly of said at least one finger engagement surface for sensing light from said illuminator scattered by engagement of a user's finger with said at least one finger engagement surface; and

a data entry processor receiving an output from said two-dimensional imaging sensor and providing a data entry input to said portal unlocking functionality.

14. Access control apparatus according to claim 13 wherein said illuminator is located at a location inwardly of said at least one engagement surface.

15. Access control apparatus according to claim 13 wherein said at least one finger engagement surface comprises a one-dimensional array of a plurality of finger engagement surfaces.

16. Access control apparatus according to claim 13 wherein said at least one finger engagement surface comprises a two-dimensional array of a plurality of finger engagement surfaces.

17. Access control apparatus according to claim 13 and also comprising an illumination director cooperating with said illuminator for providing an illumination beam generally parallel to said at least one finger engagement surface.

18. Access control apparatus according to claim 17 wherein said illumination director comprises a prism.

19. Data entry apparatus for use with at least one at least partially light transmissive user finger engagement surface, said data entry apparatus comprising:
an illuminator operative to illuminate said at least one user finger engagement surface;
a two-dimensional imaging sensor viewing said at least one user finger engagement surface from a location inwardly of said at least one finger engagement surface for sensing light from said illuminator scattered by engagement of a user's finger with said at least one finger engagement surface; and
a data entry processor receiving an output from said two-dimensional imaging sensor and providing a data entry input.

20. Data entry apparatus according to claim 19 wherein said illuminator is located at a location inwardly of said at least one engagement surface.

21. Data entry apparatus according to claim 19 wherein said at least one finger engagement surface comprises a one-dimensional array of a plurality of finger engagement surfaces.

22. Data entry apparatus according to claim 19 wherein said at least one finger engagement surface comprises a two-dimensional array of a plurality of finger engagement surfaces.

23. Data entry apparatus according to claim 19 and also comprising an illumination

director cooperating with said illuminator for providing an illumination beam generally parallel to said at least one finger engagement surface.

24. Data entry apparatus according to claim 23 wherein said illumination director comprises a prism.

25. Data entry apparatus for use with at least one engagement surface, said data entry apparatus comprising:

a light emitting data entry engagement element, which emits light only when it is in at least predetermined propinquity to said at least one engagement surface;

a two-dimensional imaging sensor viewing said at least one engagement surface for sensing light emitted by said light emitting data entry engagement element; and

a data entry processor receiving an output from said two-dimensional imaging sensor and providing a data entry input.

26. Data entry apparatus according to claim 25 wherein said light emitting data entry engagement element comprises an elongated element having an LED at an end thereof.

27. Data entry apparatus according to claim 26 wherein said LED comprises an IR emitting LED.

28. Data entry apparatus according to claim 25 and also comprising a proximity switch.

29. Data entry apparatus for use with at least one engagement surface, said data entry apparatus comprising:

a projector operative to illuminate said at least one engagement surface and to define thereon at least one touchpad region and at least one keyboard region, said touchpad region being defined by a zero'th order diffracted image;

an illuminator operative to illuminate said at least one engagement surface;
a two-dimensional imaging sensor viewing said at least one engagement surface from a location inwardly of said at least one engagement surface for sensing light from said illuminator scattered by engagement of a user's finger with said at least one engagement surface; and
a data entry processor receiving an output from said two-dimensional imaging sensor and providing a data entry input.

30. Data entry apparatus according to claim 19 wherein said processor comprises the following functionality:

as each pixel value is acquired, determining, using pixel coordinates, whether that pixel lies within a predefined keystroke region;

acquiring pixel values for said pixel coordinates lying within said predefined keystroke region;

adding or subtracting each of said pixel values to or from a pixel total maintained for each said keystroke region based on determining a pixel function of each pixel;

comparing said pixel total for each said keystroke region with a current key actuation threshold;

if the pixel total exceeds the key actuation threshold for a given keystroke region in a given frame and in the previous frame the pixel total did not exceed the key actuation threshold for that keystroke region, providing a key actuation output; and

if the pixel total does not exceed the key actuation threshold for a given keystroke region in a given frame and in the previous frame the pixel total did exceed the key actuation threshold for that keystroke region, providing a key deactuation output.

31. A data input device comprising:

an illuminator operative to illuminate at least one engagement plane by directing light along said at least one engagement plane;

a two-dimensional imaging sensor, including an optical wedge element, viewing said at least one engagement plane from a location outside said at least one engagement plane for sensing light from said illuminator scattered by engagement of a data entry object with said at least one engagement plane; and

a data entry processor receiving an output from said two-dimensional imaging sensor and providing a data entry input to utilization circuitry.

32. A data input device according to claim 31 wherein said optical wedge element enables said imaging sensor to efficiently sense light from said engagement plane.

33. A data input device comprising:

an illuminator operative to illuminate at least one engagement plane by directing light along said at least one engagement plane;

a two-dimensional imaging sensor, including a pair of oppositely oriented optical wedge elements, viewing said at least one engagement plane from a location outside said at least one engagement plane for sensing light from said illuminator scattered by engagement of a data entry object with said at least one engagement plane; and

a data entry processor receiving an output from said two-dimensional imaging sensor and providing a data entry input to utilization circuitry.

34. A data input device comprising:

an illuminator operative to illuminate at least one engagement plane by directing light along said at least one engagement plane and to illuminate a proper positioning confirmation location on an engagement surface;

a two-dimensional imaging sensor, including, viewing said at least one engagement plane from a location outside said at least one engagement plane for sensing light from said illuminator scattered by engagement of a data entry object with said at least one engagement plane; and

a data entry processor receiving an output from said two-dimensional imaging sensor and providing a data entry input to utilization circuitry.

35. A data input device according to claim 34 wherein said imaging sensor senses the presence or absence of illumination at said proper positioning confirmation location.

36. A data input device according to claim 35 wherein said data entry apparatus is operative to unpower itself when said imaging sensor senses the absence of illumination at said proper positioning confirmation location.

37. Gaming apparatus comprising:
at least one game piece;
a game template projector, operative to project a game template onto a surface;
an illuminator operative to illuminate said surface; and
an imaging sensor viewing said surface for sensing light from said illuminator reflected by at least one optically encoded reflector mounted on said at least one game piece.

38. Gaming apparatus according to claim 37 wherein each of said at least one reflector identifies one of said at least one game piece and is operative to indicate a location of said at least one game piece on said game template.

39. Gaming apparatus according to claim 37 wherein said at least one reflector also identifies a spatial orientation of said game piece.